Amendment
Serial No. 10/792,322

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IN THE CLAIMS

Please amend the claim as follows:

1. (Currently amended) A multi-wavelength optical transmitter for multiplexing a plurality of channels having different wavelengths into an optical signal so as to output the optical signal, the multi-wavelength optical transmitter comprising:

a plurality of lasers configured to generate, by corresponding incoherent light received in the lasers, a plurality of mode-locked channels having different wavelengths and a mode partition noise between said mode-locked channels, each of said mode partition noise having different wavelengths and different intensities;

a multiplexer/demultiplexer configured to multiplex the plurality of mode-locked channels and the mode partition noise into an optical signal; and

a semiconductor optical amplifier (SOA) configured to amplify the optical signal in a gain saturation state and the mode partition noise of the optical signal, wherein said noise intensity is increased and rendered substantially constant, said SOA being configured to output the optical signal having the plurality of mode-locked channels, and the relatively constant intensity mode partition noise, such that the difference between said mode partition noise between channels is reduced.

2. (Previously presented) The multi-wavelength optical transmitter as claimed in claim 1, further comprising:

a broadband light source configured to generate light having a wide wavelength band including a plurality of incoherent lights having different wavelengths; and

a circulator configured to output the multiplexed optical signal to the SOA, and sending

light that is outputted from the broadband light source to the multiplexer/demultiplexer,

wherein the multiplexer/demultiplexer demultiplexes said light that is outputted from the broadband light source into a plurality of incoherent lights having different wavelengths so as to output the demultiplexed incoherent light among the lasers.

3. (Original) The multi-wavelength optical transmitter as claimed in claim 2, wherein the broadband light source includes an Erbium-doped fiber amplifier.

4. (Original) The multi-wavelength optical transmitter as claimed in claim 1, wherein the multiplexer/demultiplexer includes an arrayed waveguide grating.

5. (Previously presented) The multi-wavelength optical transmitter as claimed in claim 1, wherein the lasers include a Fabry-Perot laser configured to generate a respective mode-locked channel by incoherent light.

6. (Currently amended) A bi-directional wavelength division multiplexing system comprising a central office for outputting a downstream optical signal comprised of downstream channels and for receiving upstream channels, a plurality of subscriber terminals for receiving said downstream channels and outputting said upstream channels, and a remote node for relaying optical communication between the central office and the subscriber terminals, wherein the central office includes:

a multiplexer/demultiplexer configured to demultiplex an upstream optical signal into said upstream channels so as to output the demultiplexed channels, and to multiplex a plurality of downstream channels having different wavelengths into said downstream optical signal so as to

output the multiplexed optical signal;

a plurality of photodetectors configured to detect each of said upstream channels demultiplexed by the multiplexer/demultiplexer;

a plurality of lasers configured to generate mode-locked downstream channels by corresponding incoherent light received in the lasers and to output the generated downstream channels to the multiplexer/demultiplexer;

a semiconductor optical amplifier configured to amplify the upstream optical signal to be demultiplexed in a gain saturation state, to amplify the downstream optical signal to be outputted by the central office in a gain saturation state, to output the amplified upstream optical signal to the multiplexer/demultiplexer, wherein a noise intensity in each of said upstream and downstream optical signals is increased and rendered substantially constant and to output the amplified downstream optical signal to the remote node such that the difference between said mode partition noise between channels is reduced; and

a plurality of wavelength selection couplers configured to output ones of said upstream channels, which are outputted from the multiplexer/demultiplexer, to corresponding photodetectors, outputting corresponding incoherent light to corresponding lasers, and outputting said downstream channels, which are outputted from the lasers, to the multiplexer/demultiplexer.

7. (Previously presented) The bi-directional wavelength division multiplexing system as claimed in claim 6, wherein the central office further comprises:

a downstream broadband light source configured to output downstream light having a wide wavelength band including a plurality of incoherent lights having different wavelengths;

an upstream broadband light source configured to output upstream light having a wide

wavelength band including a plurality of incoherent lights having different wavelengths;

a circulator located between the multiplexer/demultiplexer and the SOA, configured to output the upstream optical signal and downstream light to the multiplexer/demultiplexer, and configured to output the downstream optical signal and upstream light to the semiconductor optical amplifier;

a first band pass filter (BPF) located between the downstream broadband light source and the circulator, configured to reflect an upstream optical signal received in the first BPF to the circulator, and configured to transmit downstream light to the circulator; and

a second BPF located between the upstream broadband light source and the circulator, configured to reflect a downstream optical signal received in the second BPF to the circulator, and configured to transmit upstream light to the circulator,

wherein the multiplexer/demultiplexer demultiplexes downstream light into a plurality of incoherent lights having different wavelengths so as to output demultiplexed light to each of the wavelength selection couplers.

8. (Original) The bi-directional wavelength division multiplexing system as claimed in claim 7, wherein the downstream broadband light source uses an Erbium doped fiber amplifier outputting spontaneous emission light in a wavelength band of 1550nm.

9. (Original) The bi-directional wavelength division multiplexing system as claimed in claim 7, wherein the upstream broadband light source uses an Erbium doped fiber amplifier outputting spontaneous emission light in a wavelength band of 1310nm.

10. (Original) The bi-directional wavelength division multiplexing system as claimed in claim 6, wherein the lasers include Fabry-Perot lasers.

11. (Previously presented) The bi-directional wavelength division multiplexing system as claimed in claim 6, wherein the remote node includes a multiplexer/demultiplexer configured to multiplex said upstream channels outputted from each of the subscriber terminals into said upstream optical signal configured to output to the central office, demultiplexing upstream light outputted from the central office into a plurality of incoherent lights having different wavelengths so as to output the demultiplexed upstream light to a corresponding subscriber terminal, and demultiplexing said downstream optical signal into said plurality of downstream channels configured to output to corresponding ones of the plural subscriber terminals.

12. (Previously presented) The bi-directional wavelength division multiplexing system as claimed in claim 6, wherein the remote node includes a multiplexer/demultiplexer configured to demultiplex upstream light and a downstream optical signal each configured to output to the subscriber terminals, the multiplexer/demultiplexer of the remote node multiplexing a plurality of upstream channels having different wavelengths, which are outputted from the subscriber terminals, into said upstream optical signal for transmission to the central office.

13. (Original) The bi-directional wavelength division multiplexing system as claimed in claim 12, wherein the multiplexer/demultiplexer of the remote node uses an arrayed waveguide grating demultiplexing upstream light received in the multiplexer/demultiplexer of the remote node into a plurality of incoherent lights having different wavelengths, demultiplexing said downstream optical signal into said plurality of downstream channels, and outputting the

demultiplexed downstream channels and incoherent light to the subscriber terminals.

14. (Previously presented) The bi-directional wavelength division multiplexing system as claimed in claim 6, wherein each of the subscriber terminals comprises:

a laser configured to generate a mode-locked upstream channel by corresponding incoherent light so as to output the generated mode-locked upstream channel;

a photodetector configured to detect a corresponding one of the downstream channels; and

a wavelength selection coupler configured to output the mode-locked upstream channel to the remote node, outputting said corresponding one of the downstream channels, which is outputted from the remote node, to the photodetector, and outputting to the laser said corresponding incoherent light.

15. (Original) The bi-directional wavelength division multiplexing system as claimed in claim 14, wherein the lasers include Fabry-Perot lasers.

16. (Previously presented) A method for multiplexing comprising:

generating, by corresponding incoherent light received, a plurality of mode-locked channels having different wavelengths and a mode-partition noise between said channels, each of said mode_partition noise having wavelengths and different intensities;

multiplexing the plurality of mode-locked channels and the partition noise into an optical signal;

amplifying, in a gain saturation state, the optical signal, wherein said intensity of the mode-partition noise is increased and rendered substantially constant; and

outputting the optical signal having the plurality of mode-locked channels, the mode-locked channels having different wavelengths, and the mode-partition noise, such that the difference between said mode partition noise between channels is reduced.

17. (Original) The method as claimed in claim 16, further comprising the steps of:

generating light having a wide wavelength band including a plurality of incoherent lights having different wavelengths; and

outputting the multiplexed optical signal for said amplifying, and sending the generated light source for demultiplexing into a plurality of incoherent lights having different wavelengths so as to output the demultiplexed incoherent light among lasers.

18. (Original) The method as claimed in claim 17, wherein said generating light having a wide wavelength band is performed by a broadband light source that includes an Erbium-doped fiber amplifier.

19. (Original) The method as claimed in claim 16, wherein the multiplexing is performed by a multiplexer/demultiplexer that includes an arrayed waveguide grating.

20. (Original) The method as claimed in claim 16, wherein the generating is performed by lasers that include a Fabry-Perot laser for generating a respective mode-locked channel by incoherent light.

21. (Cancelled)